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ABSTRACT

Three Minnesota correctional institutions used computer-assisted instruction (CAI) on PLATO terminals to improve reading and mathematics skills: (1) the State Reformatory for Men, St. Cloud (males, ages 17-21); (2) the Minnesota Home School, Sauk Centre (males and females, ages 12-18); and (3) the State Training School, Red Wing (males, ages 13-18). Curriculum packages included PLATO Corrections Project Mathematics Curriculum, the Basic Skills Mathematics Curriculum, and the Basic Skills Reading Curriculum. Program evaluation concentrated on basic skills; students' attitudes toward mathematics, reading, learning, and CAI; success in program implementation; and staff attitudes toward CAI. Suitability of the curricula and technical issues in administering CAI programs were also considered. Achievement gains were measured by the Tests of Adult Basic Education (TABE); the Student Attitude Survey and interviews were used to elicit students' and teachers' reactions. Results did not clearly support CAI effects on achievement, although the students did show progress. Students' attitudes showed improvement, but this was not related to instructional time or use of the computer. Students' attitudes toward CAI were generally positive. Staff attitudes were positive at two of the institutions. (Recommendations, the four-part student Attitude Survey, and interview questions are appended). (GDC)

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Evaluation of Title I CAI Programs at Minnesota State Correctional Institutions*

by

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July, 1978

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I. Introduction

A. The Program

Funds have been made available under a Title I grant for a program of computer-assisted instruction (CAI) at three Minnesota State correctional institutions. The main purpose of this program is to improve the basic reading and mathematics skills of those in the correctional population who meet the Title I requirements of youth and educational disadvantage. The CAI program was undertaken at the State Reformatory for Men at St. Cloud and at two institutions for juveniles: the Minnesota Home School at Sauk Centre and the State Training School at Red Wing. The program used the PLATO system of Control Data Corporation, with PLATO terminals being installed in the three institutions.

Administering the Title I funds for the CAI program was the responsibility of the Minnesota State Department of Corrections. The Department of Corrections contracted with the Minnesota Educational Computing Consortium (MECC) to plan and administer the program at the three sites. The actual implementation of the program was carried out by site personnel.

B. The Evaluation

Title I grants require an evaluation component. To fulfill this requirement, MECC contracted with the Minnesota Research and Evaluation Center at the University of Minnesota to evaluate the CAI program at the three institutions for the 1977-78 school year. The two evaluators involved were Dr. Richard S. Sandman and Dr. Wayne W. Welch.

Dr. Sandman is a Research Associate in the Minnesota Research and Evaluation Center. He has participated in several evaluation studies and

has taught evaluation courses in Malaysia. He holds academic degrees in mathematics and educational psychology.

Dr. Welch, a Professor of Educational Psychology, is Director of the Minnesota Research and Evaluation Center. He has had extensive experience directing and carrying out evaluation projects in a variety of settings, and holds academic degrees in science and in science education.

The evaluation seeks to provide information and recommendations to a variety of audiences relating to many different kinds of decisions that need to be made about CAI programs in correctional institutions. The purposes of the evaluation, therefore, are as follows:

1. to meet the evaluation requirements for Title I grants;
2. in the event Title I money is no longer available, to inform other agencies concerning the value of CAI in correctional institutions;
3. to provide information to computer vendors to help them improve their curriculum packages;
4. to provide information to MECC so it can improve its CAI program offerings to correctional institutions;
5. to provide information to site personnel to help them improve the effectiveness of CAI program implementation.

II. Description of the Program

A. Objectives

Among the residents of correctional institutions are those who are considerably deficient in basic reading and mathematics skills. These people, if two years below grade level and under the age of 21, are eligible for a special Title I program that has been in operation for some time at the three institutions of concern. This program provides for each student about an hour a day of remedial work in mathematics and reading. Instruction is tutorial in nature, with teachers working either with individual students or with a few students at a time. The thought is that improving the basic skills of these institutional residents will increase their chances of making a suitable adjustment to society upon leaving the institution.

The addition of the computer to this Title I program is seen as providing another tool for accomplishing the same objective. Perhaps some things can be more easily taught on the computer; perhaps the computer can provide better opportunities for individualized drill and practice; perhaps some students will react more favorably to a computer than to a teacher. Possibilities such as these have potential for increasing the effectiveness of the Title I program.

While no current set of objectives was given to the evaluators concerning the computer component of the Title I program, the objectives of the CAI program seemed clear, and were formulated by the evaluators to be as follows:

1. Students will improve their basic skills in reading and mathematics.
2. Students will develop more favorable attitudes toward reading and mathematics.

3. Students will improve their attitudes toward learning and education in general.
4. Students will learn how to learn on the computer, and will have a favorable attitude toward this learning.
5. Title I staff will learn how to implement a CAI program in mathematics and reading, and will be able to integrate this program into the regular Title I instruction.
6. Title I staff will develop favorable attitudes toward the computer as a tool to aid in Title I instruction.

B. Program Settings

St. Cloud

The State Reformatory for Men is located on the outskirts of St. Cloud, about 60 miles northwest of Minneapolis. This is a maximum-security prison for young adult offenders. The high walls, bars, and the involved checking system for entry lend a very definite prison atmosphere to the institution. An extensive educational program is made available to the inmates including academic, vocational, and remedial offerings. At any one time there are from 25 to 50 men enrolled in the Title I program, all on a voluntary basis. The group ranges in age from 17 to 21 and includes Caucasians, Blacks, and Native Americans.

There is one PLATO terminal located at St. Cloud. It has been installed in the corner of one of the rooms used for regular Title I instruction. While St. Cloud has had previous experience with computer terminals, the PLATO terminal installed for the Title I program in September, 1977 is the first experience the institution has had with the PLATO system. There

were four Title I staff members of whom three were regularly involved with the students' use of the computer.

Sauk Centre

The Minnesota Home School is located at Sauk Centre, about 100 miles northwest of Minneapolis. This is a minimum-security institution for juvenile offenders from the rural areas of Minnesota. The buildings and grounds are very attractive, and the atmosphere is relaxed, giving the feeling of a country boarding school. All residents must participate in the educational program, which allows students to continue with their high school courses. The Title I program is required for those eligible. At any one time there are between 25 and 50 students in the Title I program, both boys and girls. The age range is from 12 to 18, and the group is multiracial in nature.

There are two PLATO terminals at Sauk Centre. These have been placed in a separate room adjacent to the rooms used for the regular Title I instruction. Sauk Centre has used computer terminals before, but the September, 1977 installation of the PLATO terminals represents the first experience the institution has had with the PLATO system. Of the seven Title I staff members, six were regularly involved with the students' use of the computer.

Red Wing

The State Training School is located at Red Wing, about 60 miles southeast of Minneapolis. This is a minimum-security institution for juvenile offenders from the urban areas of Minnesota, including the Twin Cities area. The building and grounds are reasonably attractive, and the school program is housed in a building which looks much like any public school. Here, also,

education is required, and students can follow their high school courses. The Title I program is required for those eligible, and contains from 25 to 50 students, all boys. It is a multiracial group, with the ages ranging from 13 to 18.

Two PLATO terminals are located at Red Wing. These have been placed in a separate room, down the hall from the rooms used for the regular Title I instruction. These terminals have been in use since August, 1976, so at Red Wing the current year's program represents a continuation of the use of the PLATO system. There were five Title I staff, but only one was involved with the students' use of the computer, with another acting as substitute from time to time.

C. Computer Curricula

Students in the Title I program at the three institutions were exposed to computer curricula in basic mathematics and reading. Three curriculum packages were used: the PLATO Corrections Project (PCP) Mathematics Curriculum, the Basic Skills Mathematics Curriculum, and the Basic Skills Reading Curriculum.

PCP Mathematics Curriculum

The PCP Mathematics Curriculum is a group of computer lessons especially selected to meet the needs of basic mathematics students at correctional institutions. The package was put together by people at the University of Illinois; the lessons included were selected from a much larger set of lessons developed at that institution. Lessons treat the basic mathematics skills: addition, subtraction, multiplication, division, fractions, decimals, percents, ratio and proportion, and simple algebra and geometry.

The lessons included have a variety of formats: there is no necessary connection between one lesson on a topic and another lesson on the same topic. Lessons could be assigned individually at any time, the assignment not depending on the completion of previous lessons. Thus the PCP package is really a collection of lessons rather than an integrated curriculum.

Included among the PCP lessons are what can be called math games. These are opportunities for students to use their math skills in entertaining and motivating game situations such as racing around a speedway or fighting a war.

Basic Skills Mathematics Curriculum

The Basic Skills Mathematics Curriculum is an integrated curriculum in the basic math skills whose development was coordinated by Control Data Corporation and which is being marketed by that company. The version used at the three institutions was a preliminary version actually designed for elementary school pupils. It was intended to revise and expand this curriculum for adult students, but this had not yet been done at the time the curriculum was implemented at the institutions. The version used contained five major units, called strands: addition, subtraction, multiplication, division, and fractions. Strands were subdivided into sets of objectives called bundles. These were further subdivided into small sets of related objectives called clusters. Upon entering the curriculum, the student would take an Inventory Test which would determine the strand and cluster where the student should begin working. From this point the student would proceed linearly through the curriculum, for each cluster going through a Tutorial lesson, a Drill and Practice lesson, and a Mastery Test before moving on to the next cluster.

Once the student was placed in the curriculum, there was no way he could advance, or be advanced by his teacher, except by going through each lesson one by one. A visual record of the student's progress through the curriculum was accessible to the student, or his teacher, on the computer.

Basic Skills Reading Curriculum

The Basic Skills Reading Curriculum is an integrated curriculum in basic reading skills whose development and marketing is also under the management of Control Data Corporation. The version of this curriculum available to the institutions was more sophisticated and complete than the associated math curriculum, and had already been adapted for use by adults. The same strand, bundle, and cluster organization was employed. There were five strands: building new words from old words, learning a new vocabulary, understanding the facts you read, interpreting the facts you read, and separating fact from opinion. Here, each strand had its own Inventory Test which would place the student at the appropriate cluster within that strand. Each cluster also had a Pretest which gave the student another opportunity to pass through the cluster without going through the Tutorial and the Drill and Practice. Were the student to take actual instruction in the cluster, he would have to pass a Progress Check before moving on to the next cluster. A Review Check at the end of each bundle insured that the student had some retention of what was covered in that bundle. A student did not have to complete all clusters of one strand before beginning work on a later strand. An additional element of flexibility allowed teachers to skip students over clusters or to move them back for further review. In this curriculum also, a visual record of each student's progress was kept by the computer.

In addition to these three curriculum packages, a small set of reading games was available so that students could use their reading skills in amusing ways. These games were taken from the large catalog of lessons developed at the University of Illinois.

D. Program Design and Implementation

The intention of the MECC staff was to try out the CAI program in math at a separate time from the CAI program in reading. The plan was to make the math curricula available on the computer from October 1, 1977 to February 1, 1978, and then to switch over to the reading curriculum and go until May 1, 1978. Because of problems in getting the reading curriculum ready, the actual switch-over date was delayed until March 1, and the period of the reading curriculum was extended until May 10.

The PLATO terminals were installed at St. Cloud and at Sauk Centre in the middle of September, 1977. At that time a three-day workshop was conducted by the MECC staff at each institution. The purpose was to familiarize the site personnel with the operation of the computer terminals, the signing on of students, the mathematics curricula available, and the details of administering the CAI program. A guide to the PCP Mathematics Curriculum, put together by MECC, was given to each staff member. At Red Wing, where PLATO terminals had already been in operation for a year, only a one-half day workshop was necessary. Each institution was provided a short follow-up workshop late in February to introduce the site staff to the reading curriculum.

The first time a student used the computer, he was shown how to sign on and off and was asked to go through the Introduction to PLATO lesson.

Then, if he was doing math, he was assigned to use either the PCP Curriculum, the Basic Skills Curriculum, or both, depending upon his remedial needs as determined by diagnostic tests and the perception of his teachers. If he used the PCP Curriculum, he was assigned a maximum of ten lessons to work on. Completion of these lessons was recorded by the computer, and also, sometimes, by an off-line record-keeping system. When several of the assigned lessons had been completed, they were replaced by new lessons assigned to the student. If the student used the Basic Skills Mathematics Curriculum, he was given the Inventory Test and began working at the point where he was placed in the curriculum. If the student was doing reading, he used the Basic Skills Reading Curriculum and began by taking the Inventory Test for the first strand.

It is in the nature of correctional institutions that people are entering and leaving at all times. Thus the group of Title I students is ever-changing, with the lengths of stay in the program ranging from a couple of weeks to several months. At St. Cloud and Red Wing, students entering the Title I program are assigned to study either mathematics or reading or both, depending upon the deficiencies shown in achievement examinations and the opinion of the teachers. At Sauk Centre all Title I students study both mathematics and reading. Students studying both subjects divide their regular Title I hour a day evenly between the two subjects. During the October to May period, a student was assigned to use the computer if the curricular subject currently available on the computer corresponded to a subject that the student was studying in the Title I program.

At St. Cloud students were scheduled on the computer three times a week at 15 minutes each period. These 45 minutes a week were subtracted from the

regular Title I instruction that the student received in the computer subject. At Sauk Centre students used the computer for 22-1/2 minutes four times a week. These 90 minutes a week were added on to the regular Title I instruction. The Red Wing students were scheduled on the computer for 20 minutes three times a week. The 60 minutes a week were also an addition to the regular Title I time. Thus it can be seen that at all three institutions the time spent on the computer was a small portion of the total Title I instructional time. Students therefore received much more of their Title I basic skills instruction off the computer than on the computer.

It was desired to use the math and reading games as motivational devices to encourage students through the instructional lessons. Accordingly, at St. Cloud and Red Wing, students were permitted one game period on the computer for every five periods of instructional lessons. At Sauk Centre seven instructional periods were required before one game period was given. This system was monitored by the teachers with the help of computer and off-line records.

At St. Cloud the computer terminal was located in a room where Title I tutorial instruction was also taking place. The staff member carrying on this instruction was also responsible for monitoring the student using the computer, and for answering any questions he might have. At Sauk Centre the Title I staff gave tutorial instruction in rooms adjacent to the computer room. From time to time a staff member would go over to see what was happening in the computer room, or a student would come from the computer room to ask a question. At Red Wing one staff member spent full time in the computer room monitoring the students and answering their questions.

Every day each institution submitted, via the computer, a Daily Log to MECC. The Daily Log reported on the problems encountered with the CAI program that day. Curriculum and administrative problems were handled by the MECC staff, while technical problems with the terminals were taken care of by Control Data Corporation. Problems could also be communicated by messages over the computer, and telephone communication was also maintained.

III. Evaluation Design

A. Evaluative Questions

One of the main reasons for conducting the evaluation was to see to what extent the CAI program was meeting its objectives. Therefore, the evaluative questions which relate to this follow directly from those objectives, and are as follows:

1. To what extent have students improved their basic skills in mathematics and reading by virtue of being exposed to the CAI program?
2. To what extent have students improved their attitudes toward mathematics and reading?
3. How have the students' attitudes toward learning and education changed?
4. Have the students learned how to learn on the computer, and do they have a favorable attitude toward this learning?
5. How successful are the Title I staff in implementing a CAI program, and how well do they integrate this program into their regular Title I instruction?
6. What are the attitudes of Title I staff toward using the computer in Title I instruction?

In addition, several other evaluative questions were identified which seemed to bear directly on the effectiveness of the CAI program and its ability to meet its objectives. These are as follows:

7. How successful were the computer curricula that were used? How could these curricula be improved?
8. What kinds of technical problems arose with the computer terminals? Are there ways to avoid these problems?

9. Which features of the program's design and implementation worked well, and which could be improved upon?
10. How heavy was the use of the computer terminals? Did students use all their scheduled time?
11. How much does it cost to have the computer terminals at the three institutions and to use the relevant curriculum packages?

B. Evaluation Procedures

The information needed to answer the above questions was obtained by giving the students achievement and attitude measures, making on-site visits, monitoring records kept by the computer, inspecting the computer curricula, and requesting data on costs. Details are given below.

Achievement and Attitude Testing

Achievement Instrument. The instrument chosen to measure achievement in this evaluation was the Tests of Adult Basic Education (TABE), 1976 Edition, published by CTB/McGraw-Hill. The TABE is a battery of tests aimed at assessing the basic mathematics, reading, and language skills of adults. There are three levels: Easy (Grades 2-4), Medium (Grades 4-6), and Difficult (Grades 6-8). There are two forms at each level, Form 3 and Form 4. The items at each level are adapted from items at the same level of the California Achievement Test (CAT), 1970 Edition. Adaptation of the CAT items consisted of altering their language and content so they would be suitable for adults. This feature of the TABE makes it appropriate for use at the three institutions, for students in the 12-21 age range would probably not appreciate being tested at lower levels using young children's language and content. The TABE has been empirically equated to the CAT, so norms are available for the TABE based on this relationship.

It was decided to use the Reading Vocabulary and Reading Comprehension subtests of the TABE to assess improvement in basic reading skills. The Mathematics Computation subtest was used to measure changes in basic math skills. The subtests of the TABE had the additional advantage of providing diagnostic information to the teachers regarding a student's deficiencies in the basic skill areas.

Attitude Instrument. The Student Attitude Survey (SAS) is an instrument especially developed for use in this evaluation project. The SAS consists of 66 items, all of which are statements to which a student can either strongly agree, agree, disagree, or strongly disagree. The instrument is composed of four separate parts measuring attitudes toward mathematics, reading, learning and education, and learning on the computer. Each of the four parts can be considered a scale, with a scale score being the sum of the item scores. In addition, the first three scales are subdivided into various subscales. The makeup of the four parts of the SAS is given below in outline form. The instrument itself is attached as Appendix A.

1. Attitudes toward Mathematics - 5 subscales, 4 items each, 20 items total
   a. unanxiety toward mathematics
   b. value of mathematics in society
   c. self-concept in mathematics
   d. enjoyment of mathematics
   e. motivation in mathematics
2. Attitudes toward Reading - 4 subscales, 3 items each, 12 items total
   a. value of reading
   b. self-concept in reading

c. enjoyment of reading

d. motivation in reading

3. Attitudes toward Learning and Education - 4 subscales, 4 items each, 16 items total

a. value of education

b. self-concept in learning

c. enjoyment of learning

d. motivation in learning

4. Attitudes toward Learning on the Computer - 18 items

Testing Design. The evaluation period for achievement and attitude testing began November 1, 1977 and ended May 10, 1978. The testing was carried out in such a way as to allow comparisons being made between students studying a subject with access to the computer and students studying the subject without such access. It is only the program decision to switch on March 1 from math on the computer to reading on the computer that permits such comparisons to be made. The diagram below should help make this clear.

	Dates Studied	
Subject Studied	Nov. 1 - Feb. 28	March 1 - May 10
Mathematics	With Computer	Without Computer
Reading	Without Computer	With Computer

Thus Title I students studying math prior to March 1 can be compared with those studying math after March 1 to assess the effect of the CAI program in mathematics. Similarly, the effect of the CAI program in reading can be measured by comparing the students in reading before March 1 with those in

reading after March 1. Since some students will overlap the two time periods, the actual amounts of time students spend both off and on the computer in studying a subject will have to be taken into account in making these comparisons.

Accordingly, on November 1 pretesting began at the three institutions. All students who were then in the Title I program were given Form 3 of the TABE subtests which corresponded to the subjects they were then studying in Title I: Reading Vocabulary and Reading Comprehension for reading students, Mathematics Computation for math students, and all three for students studying both subjects. The level of the test given was determined by an earlier administration of the Wide Range Achievement Test (WRAT), required upon entrance into Title I, and teacher discretion. Students could be tested at different levels for the reading and mathematics subtests.

Pretesting included administration of the SAS, each student receiving the sections on attitudes toward mathematics and reading which corresponded to the subjects studied, along with the section on attitudes toward learning and education. The section on computers was reserved for the posttest.

Students entering the Title I program after November 1 were pretested as they came in. As students left the program, they were posttested with Form 4 of the same TABE subtests they had received for the pretest, and at the same levels. They also received the same sections of the SAS, along with the section on attitudes toward learning on the computer if they had used the computer at all. Students still in the Title I program on May 10 were posttested at that time.

All testing was carried out by site personnel. The pretesting and posttesting each required about two hours of testing time per student. In some

cases group testing was employed, while at other times the testing had to be done on an individual basis. Often the two hours of testing had to be spread out over several days. Initially the teachers objected to so much testing, but they appeared to accept it more as time went on. Apparently the teachers found the diagnostic capabilities of the TABE of some value, for the test is still being used in all three institutions even though the evaluation period is over.

It was not always possible to posttest a student. Sometimes the student left the institution without sufficient warning for a posttest to be given. Occasionally a student would refuse to take a posttest. In a few cases the wrong posttest was given to a student. By and large, though, a fairly satisfactory record of pretests and posttests was obtained for the Title I students at the three institutions.

In order that the desired comparisons could be made, the Title I teachers were asked to keep a record of each student's instructional time both off and on the computer in mathematics and reading. The on-computer time was later corroborated, and in some cases modified, by reference to computer-kept records.

On-Site Visits

Visits to the three institutions were conducted by the evaluators on four occasions: in September, December, February, and April.

In September the evaluators were present at the orientation workshops for Title I teachers conducted by the MECC staff. Here the evaluators introduced themselves to site personnel, described their evaluation plans, and listened to learn more about the CAI program and its implementation at each institution.

In December the objective of the site visits was to obtain some impressions about the mathematics component of the CAI program. All Title I staff involved with the computer were interviewed concerning the implementation of the CAI program at their institution and their views about this program. About six representatively-selected Title I students at each institution were questioned about their experiences in using the computer to learn math. The staff and student interview schedules used are included in Appendix B. In addition, some direct observation was made of students doing math on the computer. The February visits were for the purpose of making more lengthy observations of the students' interaction with the computer in doing math. The April visits repeated the activities of the December visits except that the interviews and observations were all carried out with reference to the CAI program in reading, rather than mathematics. Copies of the interviews used are also in Appendix B.

Computer Records

The Daily Log submitted each day by each site enumerated the problems faced by that institution in running the CAI program that day. The Daily Logs were stored by the computer and later converted to hard copy for perusal by MECC staff and the evaluators. These provided information concerning the recurring technical, administrative, and curricular problems that were encountered by site personnel.

The computer kept a record of the time each student spent on the computer and the curricula in which that time was spent. Records of instructor use of the computer were also kept. These records, when taken together, can tell how heavily the computer terminals were being used, and which curricula

were receiving the most attention. Thus the evaluators saw this as important information to gather.

The Basic Skills Mathematics Curriculum was in a preliminary form when used by the three institutions, and it was used in conjunction with the PCP Mathematics Curriculum. However, the Basic Skills Reading Curriculum was more fully developed, and was the only reading curriculum available to the institutions. Therefore it seemed reasonable that the records of student progress through the strands of this curriculum, kept by the computer, would give an indication of how well the reading students at the three institutions were achieving on the computer. Thus these records were monitored by the evaluators.

Curriculum Inspection

The evaluators worked through several of the instructional lessons from each of the three computer curricula, as well as some of the games. The various kinds of tests in the two Basic Skills curricula were also attempted. The objective was to obtain some idea of the suitability of the material for the purposes of the Title I population at the three institutions.

Cost Data

The evaluators obtained information regarding the costs involved in having the PLATO terminals at the three institutions and in using the computer curricula. The information was provided by the MECC staff.

IV. Outcomes

A. Student Achievement

TABE Results

During the course of the achievement and attitude testing that was carried out at the three institutions, a total of 192 Title I students contributed both pretest and posttest data: 59 at St. Cloud, 62 at Sauk Centre, and 71 at Red Wing. Some demographic characteristics of these students are given in Table 1.

Raw scores on the TABE subtests can be converted to scale scores with a range covering all three levels of the test. Thus scores from different levels can be analyzed together. The scale scores from each of the three given subtests of the TABE were analyzed separately for each institution. In each case four analyses were performed:

1. It was of interest to see if overall there had been any change in the students' scores from the pretest to the posttest. Therefore a t-test was carried out on the change scores to see if their mean was significantly different from zero.
2. There was some concern to see if the score changes could be related to the total hours of instruction the student had received in the tested subject, including time spent both on and off the computer. Students were divided into approximate thirds on the basis of this variable - high, medium, and low hours of instruction. A t-test was performed to see if the mean change score for the high hours group was significantly different from the mean change score for the low hours group.

TABLE 1

DEMOGRAPHIC CHARACTERISTICS OF TITLE I STUDENTS
CONTRIBUTING PRETEST AND POSTTEST DATA

	St. Cloud	Sauk Centre	Red Wing
Total	59	62	71
By Sex			
Male	59	44	71
Female	0	18	0
By Age			
12		1	
13			2
14		4	8
15		15	14
16		19	24
17	4	22	22
18	10	1	1
19	20		
20	22		
21	3		
By Ethnic Origin			
Caucasian	47	44	40
Black	9	2	22
Native American	3	14	9
Chicano	0	2	0

3. To investigate the computer effect, the mean change score of students who had used the computer to study the subject was compared, through a t-test, with the mean change score of students who had studied the subject without the computer.
4. An attempt was made to combine the two variables of total hours of instruction and hours on the computer in predicting the change scores. A multiple regression was used. Total hours of instruction was entered first, followed by hours on the computer. The objective was to see if knowing how much of the instructional time was spent on the computer would add significantly to the predictability of achievement gains.

The tables to be presented show the results of these four analyses. Results significant at the .10 level or better have been specially marked. Although the analyses were actually carried out on the scale scores, it is grade equivalents that have been entered in the tables to make for easier interpretation.

Reading Vocabulary Subtest. The results for the Reading Vocabulary subtest are given in Table 2. These show a marginally significant increase from the pretest to the posttest at St. Cloud and Sauk Centre. Changes in Reading Vocabulary do not seem to be related to total hours of reading instruction nor to use of the computer to study reading, except that at St. Cloud the number of computer hours was a significant negative predictor of achievement gains.

The table shows that students using the computer to study reading averaged only 4-6 hours on the computer, a small percentage of their total instructional time in reading. This small amount of computer time is a function of the way

TABLE 2

TABE RESULTS: READING VOCABULARY SUBTEST

I. ST. CLOUD

	N	Mean Grade Level			Mean Hours of Reading Instruction	
		Pretest	Posttest	Change	Total	On Computer
All Students	43	7.3	7.6	+0.3[1]	38.1	2.2
By Total Hours of Instruction						
High (41-106)	15	7.1	7.4	+0.3	64.2	2.7
Medium (25-40)	14	6.9	7.4	+0.5	33.1	2.1
Low (7-24)	14	7.9	7.8	-0.1	15.2	1.7
By Computer Use						
Some	20	7.4	7.5	+0.1	43.4	4.7
None	23	7.2	7.6	+0.4	33.6	0.0

[1]Change significant at $p < .10$

Multiple Regression on Change Scores

Step	Variable Entered	Simple r	Multiple r	Significance of Multiple r Change
1	Total Hours	.09	.09	NS
2	Computer Hours	-.28	.33	$p < .05$

TABLE 2 (cont'd)

TABE RESULTS: READING VOCABULARY SUBTEST

II. SAUK CENTRE

		Mean Grade Level			Mean Hours of Reading Instruction	
	N	Pretest	Posttest	Change	Total	On Computer
All Students	61	5.9	6.3	+0.4[1]	23.7	3.6
By Total Hours of Instruction						
High (28-78)	21	5.6	5.7	+0.1	42.8	8.1
Medium (14-27)	20	6.1	6.7	+0.6	19.5	2.1
Low (2-13)	20	6.0	6.6	+0.6	8.0	0.4
By Computer Use						
Some	35	5.8	6.1	+0.3	33.0	6.3
None	26	6.0	6.7	+0.7	11.2	0.0

[1]Change significant at $p < .10$

Multiple Regression on Change Scores

Step	Variable Entered	Simple r	Multiple r	Significance of Multiple r Change
1	Total Hours	-.04	.04	NS
2	Computer Hours	.04	.15	NS

TABLE 2 (cont'd)

TABE RESULTS: READING VOCABULARY SUBTEST

III. RED WING

		Mean Grade Level			Mean Hours of Reading Instruction	
	N	Pretest	Posttest	Change	Total	On Computer
All Students	37	4.9	4.9	0.0	21.4	3.0
By Total Hours of Instruction						
High (27-37)	14	4.8	4.9	+0.1	28.9	4.9
Medium (20-26)	9	4.9	5.3	+0.4	22.9	2.9
Low (5-19)	14	4.9	4.8	-0.1	12.9	1.1
By Computer Use						
Some	19	4.4	4.3	-0.1	24.8	5.8
None	18	5.3	5.5	+0.2	17.8	0.0

Multiple Regression on Change Scores

Step	Variable Entered	Simple r	Multiple r	Significance of Multiple r Change
1	Total Hours	.25	.25	NS
2	Computer Hours	-.01	.29	NS

the CAI program was set up at the three institutions. It is possible that a program plan calling for a more concentrated exposure to the computer would produce different results. This consideration of low computer time is present in all the computer versus no-computer comparisons that follow.

It is also well to consider that students taking the TABE posttest at these institutions are not always motivated to give their best effort. Their knowledge of imminent release from the institution may in some cases produce a "who cares" attitude toward the posttesting. Since there is no reliable way of separating out these students, all the scores have been included in the means presented. Thus the TABE posttest means may be somewhat depressed.

Reading Comprehension Subtest. Results for the Reading Comprehension subtest are presented in Table 3. Although all three institutions show overall gains, only the gain at Sauk Centre is significant. At all three institutions the achievement gains seem to be positively related to the total hours of instruction in reading, but there is no apparent effect of the computer instruction.

Mathematics Computation Subtest. Table 4 shows the results for the Mathematics Computation subtest. Here, all three institutions show significant gains from the pretest to the posttest. While at St. Cloud and Red Wing the gains show some relationship with the total hours of mathematics instruction, at all three institutions there is no evident computer effect.

Summary. Overall the institutions showed gains in all three subtests of the TABE. However, the gains in the mathematics subtest were larger

TABLE 3

TABE RESULTS: READING COMPREHENSION SUBTEST

I. ST. CLOUD

		Mean Grade Level			Mean Hours of Reading Instruction	
	N	Pretest	Posttest	Change	Total	On Computer
All Students	42	7.7	7.9	+0.2	37.8	2.2
By Total Hours of Instruction						
High (41-106)	14	7.1	8.2	+1.1[1]	64.9	2.8
Medium (25-40)	14	7.3	7.4	+0.1	33.1	2.1
Low (7-24)	14	8.6	8.1	-0.5[1]	15.2	1.7
By Computer Use						
Some	19	7.9	8.0	+0.1	42.8	4.8
None	23	7.5	7.8	+0.3	33.6	0.0

[1]Difference in change significant at $p < .05$

Multiple Regression on Change Scores

Step	Variable Entered	Simple r	Multiple r	Significance of Multiple r Change
1	Total Hours	.16	.16	NS
2	Computer Hours	-.01	.17	NS

TABLE 3 (cont'd)

TABE RESULTS: READING COMPREHENSION SUBTEST

II. SAUK CENTRE

	N	Mean Grade Level			Mean Hours of Reading Instruction	
		Pretest	Posttest	Change	Total	On Computer
All Students	61	4.9	5.6	+0.7[1]	23.7	3.6
By Total Hours of Instruction						
High (28-78)	21	4.2	5.6	+1.4[2]	42.8	8.1
Medium (14-27)	20	5.4	5.8	+0.4	19.5	2.1
Low (2-13)	20	5.0	5.5	+0.5[2]	8.0	0.4
By Computer Use						
Some	35	4.9	5.8	+0.9	33.0	6.3
None	26	4.9	5.4	+0.5	11.2	0.0

[1]Change significant at $p < .001$

[2]Difference in change significant at $p < .10$

Multiple Regression on Change Scores

Step	Variable Entered	Simple r	Multiple r	Significance of Multiple r Change
1	Total Hours	.19	.19	NS
2	Computer Hours	.09	.24	NS

TABLE 3 (cont'd)

TABE RESULTS: READING COMPREHENSION SUBTEST

III. RED WING

	N	Mean Grade Level			Mean Hours of Reading Instruction	
		Pretest	Posttest	Change	Total	On Computer
All Students	35	4.5	4.7	+0.2	21.8	3.0
By Total Hours of Instruction						
High (27-37)	14	4.1	4.9	+0.8[1]	28.9	4.9
Medium (20-26)	8	4.3	4.9	+0.6	22.9	2.5
Low (5-19)	13	4.9	4.4	-0.5[1]	13.5	1.2
By Computer Use						
Some	18	3.9	4.1	+0.2	24.9	5.8
None	17	5.0	5.3	+0.3	18.5	0.0

[1]Difference in change significant at $p < .05$

Multiple Regression on Change Scores

Step	Variable Entered	Simple r	Multiple r	Significance of Multiple r Change
1	Total Hours	.31	.31	$p < .10$
2	Computer Hours	.15	.31	NS

TABLE 4

TABE RESULTS: MATHEMATICS COMPUTATION SUBTEST

I. ST. CLOUD

		Mean Grade Level			Mean Hours of Mathematics Instruction	
	N	Pretest	Posttest	Change	Total	On Computer
All Students	46	7.2	8.5	+1.3[1]	26.0	3.2
By Total Hours of Instruction						
High (27-73)	17	5.9	7.7	+1.8	44.9	3.5
Medium (15-26)	12	8.1	9.2	+1.1	22.5	3.5
Low (3-14)	17	8.0	9.0	+1.0	9.7	2.5
By Computer Use						
Some	31	7.2	8.4	+1.2	28.1	4.7
None	15	7.3	8.8	+1.5	21.9	0.0

[1]Change significant at $p < .001$

Multiple Regression on Change Scores

Step	Variable Entered	Simple r	Multiple r	Significance of Multiple r Change
1	Total Hours	.30	.30	$p < .05$
2	Computer Hours	.00	.30	NS

TABLE 4 (cont'd)

TABE RESULTS: MATHEMATICS COMPUTATION SUBTEST

II. SAUK CENTRE

	N	Mean Grade Level			Mean Hours of Mathematics Instruction	
		Pretest	Posttest	Change	Total	On Computer
All Students	60	6.0	6.7	+0.7[1]	24.1	4.4
By Total Hours of Instruction						
High (29-61)	20	5.4	6.2	+0.8	40.0	7.4
Medium (16-28)	19	6.1	7.3	+1.2	22.1	4.4
Low (4-15)	21	6.4	6.8	+0.4	10.8	1.4
By Computer Use						
Some	47	5.9	6.7	+0.8	27.9	5.6
None	13	6.2	6.8	+0.6	10.5	0.0

[1]Change significant at $p < .001$

Multiple Regression on Change Scores

Step	Variable Entered	Simple r	Multiple r	Significance of Multiple r Change
1	Total Hours	.10	.10	NS
2	Computer Hours	.03	.13	NS

TABLE 4 (cont'd)

TABE RESULTS: MATHEMATICS COMPUTATION SUBTEST

III. RED WING

	N	Mean Grade Level			Mean Hours of Mathematics Instruction	
		Pretest	Posttest	Change	Total	On Computer
All Students	69	5.8	6.5	+0.7[1]	22.1	3.4
By Total Hours of Instruction						
High (25-42)	24	5.8	6.6	+0.8	31.0	5.7
Medium (19-24)	20	5.5	6.1	+0.6	22.0	2.6
Low (7-18)	25	6.1	6.7	+0.6	13.7	2.0
By Computer Use						
Some	54	5.8	6.5	+0.7	23.5	4.4
None	15	5.8	6.5	+0.7	17.1	0.0

[1]Change significant at $p < .001$

Multiple Regression on Change Scores

Step	Variable Entered	Simple r	Multiple r	Significance of Multiple r Change
1	Total Hours	.22	.22	$p < .10$
2	Computer Hours	.12	.22	NS

than those in the reading subtests. Gains in Mathematics Computation and Reading Comprehension were somewhat related to the amount of instruction received, but none of the subtest results seemed to be related to use of the computer.

Tables showing the TABE results for all three institutions combined are attached as Appendix C.

Progress in Basic Skills Reading Curriculum

By using computer records it is possible to tally the number of clusters of the Basic Skills Reading Curriculum in which the Title I students at each institution have shown proficiency. The results of this tallying are given in Table 5. The main conclusion seems to be that students at Red Wing pass through the clusters of the curriculum with less efficiency than students at the other two institutions. This may relate to the lower entering reading level of the Red Wing students as shown in the TABE reading subtests. Such students would not pass quickly through so many clusters by showing proficiency on an Inventory Test or a Pretest, but would have to spend time on the Tutorial and the Drill and Practice. Overall, however, there seems to be a fairly clear record of progress through the curriculum at the three institutions.

B. Student Attitudes

Student Attitude Survey Results

The data from the SAS were first analyzed to determine the scale and subscale reliabilities. Cronbach's alpha coefficient was used. The results are given in Table 6. The subscale reliabilities seem quite high considering the small number of items in each scale, and the total scale reliabilities are very satisfactory.

TABLE 5

PROGRESS OF TITLE I STUDENTS THROUGH THE BASIC SKILLS READING CURRICULUM

(Period of Record: 3/1 - 5/9)

Site	No. of Students	Mean Hours per Student	Total Clusters Passed Through	Mean Clusters per Student	Mean Clusters per Hour
St. Cloud	36	3.0	729	20.2	6.9
Sauk Centre	49	4.6	1600	32.7	7.1
Red Wing	26	4.3	491	18.9	4.4

TABLE 6

SAS SCALE RELIABILITIES

Attitude Area	Scale	No. of Items	α
Mathematics			
	Unanxiety	4	.78
	Value	4	.70
	Self-Concept	4	.73
	Enjoyment	4	.82
	Motivation	4	.61
	Total	20	.89
Reading			
	Value	3	.58
	Self-Concept	3	.70
	Enjoyment	3	.72
	Motivation	3	.64
	Total	12	.84
Learning and Education			
	Value	4	.73
	Self-Concept	4	.64
	Enjoyment	4	.61
	Motivation	4	.66
	Total	16	.86
Learning on the Computer			
	Total	18	.88

Pretest and posttest data were obtained on the first three parts of the SAS: attitudes toward mathematics, attitudes toward reading, and attitudes toward learning and education. The total scale scores for these three parts were subjected to the same four analyses that were carried out on the TABE scores. Again, the analyses were performed separately for each institution, and the tables to be presented show the results. Results significant at the .10 level or better have been indicated.

Attitudes toward Mathematics - Total Scale Score. Results are given in Table 7. These show that at St. Cloud and at Red Wing there was a significant improvement in attitude from the pretest to the posttest. At all three institutions the attitude changes were not related to the total hours of mathematics instruction nor to the use of the computer in studying mathematics.

Attitudes toward Reading - Total Scale Score. The results are presented in Table 8. All three institutions showed improvement in attitude, but only the change at St. Cloud was significant. St. Cloud also showed a slight positive relationship between attitude gains and total hours of reading instruction, and a somewhat stronger positive relationship between the attitude gains and use of the computer to study reading. These kinds of relationships were not significant at the other institutions.

Attitudes toward Learning and Education - Total Scale Score. The results are given in Table 9. Sauk Centre and Red Wing showed a significant improvement in attitude, but nowhere was there a significant relationship between the attitude changes and either the total hours of instruction or use of the computer.

TABLE 7

SAS RESULTS: ATTITUDES TOWARD MATHEMATICS (TOTAL SCALE SCORE)

(minimum score = 20, maximum score = 80, neutral point = 50)

I. ST. CLOUD

		Mean Score			Mean Hours of Mathematics Instruction	
	N	Pretest	Posttest	Change	Total	On Computer
All Students	50	55.3	58.1	+2.8[1]	26.6	3.0
By Total Hours of Instruction						
High (30-73)	18	53.3	56.4	+3.1	46.2	3.1
Medium (15-29)	14	56.9	59.1	+2.2	23.4	3.6
Low (3-14)	18	56.1	59.0	+2.9	9.4	2.5
By Computer Use						
Some	34	55.8	58.5	+2.7	27.7	4.4
None	16	54.2	57.2	+3.0	24.1	0.0

[1]Change significant at $p < .001$

Multiple Regression on Change Scores

Step	Variable Entered	Simple r	Multiple r	Significance of Multiple r Change
1	Total Hours	.12	.12	NS
2	Computer Hours	.06	.13	NS

TABLE 7 (cont'd)

SAS RESULTS: ATTITUDES TOWARD MATHEMATICS (TOTAL SCALE SCORE)

(minimum score = 20, maximum score = 80, neutral point = 50)

II. SAUK CENTRE

		Mean Score			Mean Hours of Mathematics Instruction	
	N	Pretest	Posttest	Change	Total	On Computer
All Students	61	54.3	54.8	+0.5	23.5	4.3
By Total Hours of Instruction						
High (28-61)	21	54.1	53.6	-0.5	38.6	7.2
Medium (16-27)	18	53.8	56.6	+2.8	21.7	4.5
Low (4-15)	22	55.0	54.5	-0.5	10.6	1.4
By Computer Use						
Some	48	53.8	54.9	+1.1	27.1	5.5
None	13	56.3	54.5	-1.8	10.5	0.0

Multiple Regression on Change Scores

Step	Variable Entered	Simple r	Multiple r	Significance of Multiple r Change
1	Total Hours	.11	.11	NS
2	Computer Hours	.11	.12	NS

TABLE 7 (cont'd)

SAS RESULTS: ATTITUDES TOWARD MATHEMATICS (TOTAL SCALE SCORE)

(minimum score = 20, maximum score = 80, neutral point = 50)

III. RED WING

	N	Mean Score			Mean Hours of Mathematics Instruction	
		Pretest	Posttest	Change	Total	On Computer
All Students	69	53.2	57.1	+3.9[1]	22.1	3.4
By Total Hours of Instruction						
High (25-42)	24	52.6	56.8	+4.2	31.0	5.7
Medium (19-24)	20	51.9	55.2	+3.3	22.0	2.6
Low (7-18)	25	55.0	58.8	+3.8	13.7	2.0
By Computer Use						
Some	54	53.5	57.2	+3.7	23.5	4.4
None	15	52.2	56.8	+4.6	17.1	0.0

[1]Change significant at $p < .001$

Multiple Regression on Change Scores

Step	Variable Entered	Simple r	Multiple r	Significance of Multiple r Change
1	Total Hours	.00	.00	NS
2	Computer Hours	-.07	.09	NS

TABLE 8

SAS RESULTS: ATTITUDES TOWARD READING (TOTAL SCALE SCORE)

(minimum score = 12, maximum score = 48, neutral point = 30)

I. ST. CLOUD

		Mean Score			Mean Hours of Reading Instruction	
	N	Pretest	Posttest	Change	Total	On Computer
All Students	44	34.0	35.2	+1.2[1]	30.5	2.4
By Total Hours of Instruction						
High (34-105)	15	32.1	34.9	+2.8[2]	53.6	3.7
Medium (19-33)	12	34.9	35.1	+0.2	27.5	2.6
Low (6-18)	17	34.9	35.6	+0.7[2]	12.2	1.2
By Computer Use						
Some	23	32.8	35.0	+2.2[3]	39.3	4.6
None	21	35.2	35.5	+0.3[3]	20.9	0.0

[1]Change significant at $p < .01$

[2]Difference in change significant at $p < .10$

[3]Difference in change significant at $p < .05$

Multiple Regression on Change Scores

Step	Variable Entered	Simple r	Multiple r	Significance of Multiple r Change
1	Total Hours	.16	.16	NS
2	Computer Hours	.31	.31	$p < .10$

TABLE 8 (cont'd)

SAS RESULTS: ATTITUDES TOWARD READING (TOTAL SCALE SCORE)

(minimum score = 12, maximum score = 48, neutral point = 30)

II. SAUK CENTRE

	N	Mean Score			Mean Hours of Reading Instruction	
		Pretest	Posttest	Change	Total	On Computer
All Students	61	34.2	35.2	+1.0	22.9	3.5
By Total Hours of Instruction						
High (28-78)	20	33.2	35.0	+1.8	42.2	8.2
Medium (14-27)	20	34.4	35.9	+1.5	19.5	2.1
Low (2-13)	21	35.0	34.7	-0.3	7.7	0.4
By Computer Use						
Some	34	34.3	35.7	+1.4	32.4	6.3
None	27	34.0	34.5	+0.5	10.9	0.0

Multiple Regression on Change Scores

Step	Variable Entered	Simple r	Multiple r	Significance of Multiple r Change
1	Total Hours	.09	.09	NS
2	Computer Hours	.03	.14	NS

TABLE 8 (cont'd)

SAS RESULTS: ATTITUDES TOWARD READING (TOTAL SCALE SCORE)

(minimum score = 12, maximum score = 48, neutral point = 30)

III. RED WING

		Mean Score			Mean Hours of Reading Instruction	
	N	Pretest	Posttest	Change	Total	On Computer
All Students	37	33.2	34.4	+1.2	21.6	3.0
By Total Hours of Instruction						
High (27-37)	14	34.5	33.8	-0.7	28.9	4.9
Medium (20-26)	10	32.1	33.7	+1.6	22.6	2.6
Low (5-19)	13	32.7	35.7	+3.0	12.9	1.2
By Computer Use						
Some	19	33.5	34.1	+0.6	24.8	5.8
None	18	32.9	34.8	+1.9	18.2	0.0

Multiple Regression on Change Scores

Step	Variable Entered	Simple r	Multiple r	Significance of Multiple r Change
1	Total Hours	-.19	.19	NS
2	Computer Hours	-.13	.20	NS

TABLE 9

SAS RESULTS: ATTITUDES TOWARD LEARNING AND EDUCATION (TOTAL SCALE SCORE)

(minimum score = 16, maximum score = 64, neutral point = 40)

I. ST. CLOUD

		Mean Score			Mean Hours of Mathematics and Reading Instruction	
	N	Pretest	Posttest	Change	Total	On Computer
All Students	54	48.0	49.0	+1.0	49.5	4.8
By Total Hours of Instruction						
High (59-122)	18	47.8	49.4	+1.6	81.7	5.6
Medium (31-58)	17	47.8	48.6	+0.8	48.5	5.8
Low (8-30)	19	48.4	49.1	+0.7	19.7	3.1
By Computer Use						
Some	46	48.0	49.4	+1.4	50.6	5.6
None	8	48.2	47.1	-1.1	43.1	0.0

Multiple Regression on Change Scores

Step	Variable Entered	Simple r	Multiple r	Significance of Multiple r Change
1	Total Hours	.13	.13	NS
2	Computer Hours	.11	.16	NS

TABLE 9 (cont'd)

SAS RESULTS: ATTITUDES TOWARD LEARNING AND EDUCATION (TOTAL SCALE SCORE)

(minimum score = 16, maximum score = 64, neutral point = 40)

II. SAUK CENTRE

		Mean Score			Mean Hours of Mathematics and Reading Instruction	
	N	Pretest	Posttest	Change	Total	On Computer
All Students	61	46.4	47.6	+1.2[1]	46.4	7.8
By Total Hours of Instruction						
High (54-139)	21	44.8	47.1	+2.3	76.4	13.0
Medium (30-53)	19	47.4	48.8	+1.4	42.8	7.3
Low (10-29)	21	47.1	47.1	0.0	19.7	3.1
By Computer Use						
Some	61					
None	0					

[1]Change significant at $p < .10$

Multiple Regression on Change Scores

Step	Variable Entered	Simple r	Multiple r	Significance of Multiple r Change
1	Total Hours	.12	.12	NS
2	Computer Hours	.07	.14	NS

TABLE 9 (cont'd)

SAS RESULTS: ATTITUDES TOWARD LEARNING AND EDUCATION (TOTAL SCALE SCORE)

(minimum score = 16, maximum score = 64, neutral point = 40)

III. RED WING

		Mean Score			Mean Hours of Mathematics and Reading Instruction	
	N	Pretest	Posttest	Change	Total	On Computer
All Students	71	46.9	48.5	+1.6[1]	32.9	4.9
By Total Hours of Instruction						
High (35-74)	25	46.7	47.8	+1.1	53.2	7.4
Medium (23-34)	20	45.4	49.0	+3.6	28.4	4.6
Low (7-22)	26	48.1	48.8	+0.7	16.9	2.7
By Computer Use						
Some	64	46.8	48.4	+1.6	34.8	5.4
None	7	47.9	49.3	+1.4	16.1	0.0

[1]Change significant at $p < .02$

Multiple Regression on Change Scores

Step	Variable Entered	Simple r	Multiple r	Significance of Multiple r Change
1	Total Hours	.03	.03	NS
2	Computer Hours	.14	.17	NS

Subscales. First to be looked at were the mean changes in the subscale scores from the pretest to the posttest. This was so that changes in the total scale scores could be explained in terms of the more specific attitude components. The results are given in Table 10. These show that much of the change in all three attitude areas can be attributed to an improvement in self-concept. Evidently students exposed to the institutions' Title I program become more convinced of their ability to do mathematics, to read, and to learn in general. The observed caring attitude of the Title I teachers toward their students probably contributes to this self-concept improvement. Also carried out was the multiple regression relating the subscale changes to total hours of instruction and hours on the computer. Very few significant results were obtained. These have been indicated as footnotes to Table 10.

Attitudes toward Learning on the Computer. The computer section of the SAS was given only during the posttest and only to those students who had used the computer. The section consists of 18 items forming one scale. Here it is interesting to look at the means for the individual items as well as for the total scale. The results for the three institutions are given in Table 11. Item responses are scored from 1 to 4, with 4 given to the response showing the most favorable attitude. Thus the most favorable responses were given to items 2, 3, 4, and 5, and the least favorable responses to items 7, 11, 13, and 18. Thus students thought the computer was valuable, they enjoyed using it, they found the work manageable, and they liked working at their own pace. However, they reported making lots of mistakes, not having enough time to finish lessons - this principally at the juvenile institutions, not learning any faster on the computer, and experiencing computer breakdowns.

TABLE 10

SAS SUBSCALE RESULTS[1]

Attitude Area	Subscale	Mean Score Change St. Cloud	Sauk Centre	Red Wing
Mathematics				
	Unanxiety	+0.3	+0.2	+0.7
	Value	+0.3	0.0	+0.4
	Self-Concept	+1.4	+0.3	+1.5
	Enjoyment	+0.4	+0.2[2]	+0.7
	Motivation	+0.4	-0.2	+0.5
Reading				
	Value	+0.2[2]	+0.2	+0.1
	Self-Concept	+0.5	+0.3	+0.7
	Enjoyment	+0.1[2]	+0.1	+0.3
	Motivation	+0.4	+0.3	+0.1
Learning and Education				
	Value	+0.2[3]	+0.2	+0.3
	Self-Concept	+0.8	+0.8	+0.6[4]
	Enjoyment	+0.1	-0.1	+0.1
	Motivation	0.0	+0.3	+0.6

[1]Significant multiple regression results have been indicated as footnotes. All these derive from a positive relationship between the two variables concerned.

[2]Step 2 (computer hours) significant at $p < .10$

[3]Step 1 (total hours) significant at $p < .01$

[4]Step 2 (computer hours) significant at $p < .05$

TABLE 11

SAS COMPUTER SECTION RESULTS

Item	Mean Score St. Cloud (N = 47)	Sauk Centre (N = 61)	Red Wing (N = 64)
1	3.1	3.0	3.2
2	3.2	3.1	3.4
3	3.2	3.2	3.4
4	3.2	3.1	3.4
5	3.3	3.1	3.3
6	3.2	3.0	3.3
7	2.9	2.7	2.8
8	3.1	3.0	3.3
9	3.2	3.1	3.2
10	3.0	3.0	3.2
11	3.0	2.6	2.5
12	3.1	3.0	3.4
13	2.8	2.7	3.0
14	2.9	2.8	3.0
15	3.1	2.9	3.1
16	2.9	3.0	2.9
17	3.1	3.0	3.1
18	2.7	2.7	3.0
Total	55.0	53.0	56.4

However, even these lower-scoring items had means above the neutral point of 2.5. Overall it can be said that the students showed a positive attitude toward learning on the computer.

Summary. In general the institutions showed improvement in all three attitude areas for which pretest and posttest data were collected: mathematics, reading, and learning and education. Much of this change could be attributed to an improvement in self-concept. However, the attitude changes had little relationship to the total hours of instruction or to use of the computer. Attitudes toward learning on the computer were generally positive.

Tables showing the SAS results for all three institutions combined are attached as Appendix D.

Teacher and Student Interviews

Interview data on student attitudes related mainly to attitudes toward the computer. Teachers at Sauk Centre and Red Wing indicated a generally favorable attitude on the part of students, with those students not liking the computer at least being able to accept it. At St. Cloud the teachers reported more of a mixed reaction from the students. Here, a small number of students refused to use the computer, some of these out of preference for other educational activities that would help to shorten their terms. Teachers at all institutions suggested that students maintained a positive attitude when things were going well, but reacted with frustration when the computer didn't respond according to their expectations, or when they didn't understand what they were supposed to do. Teachers saw the computer as a motivating influence for the students, mainly through their feeling special at participating in the modern technology.

Most of the students interviewed said that they liked using the computer, wanted more time to use it, and found the computer work easy. There were some exceptions to this, perhaps a somewhat larger percentage of negative views being expressed at St. Cloud.

C. Program Implementation

The Daily Logs sent in by the three institutions enumerated the problems faced in running the CAI program. Problems were divided into two types: hardware problems and software problems. Hardware problems relate to the machine technology - problems concerned with the operation of the computer and the computer terminals. Software problems relate to the curricula that the machine is trying to deliver, and the way in which the material is organized for delivery. This breakdown of problems cited in the Daily Logs is given in Table 12. The table shows that both hardware and software problems have been much in evidence at all three institutions. The particular kinds of problems encountered will be covered in the next two sections, in which information included in the Daily Logs will be integrated with that obtained from teacher and student interviews.

Technical Concerns

The two technical problems mentioned most often in the Daily Logs and by teachers and students were computer downtime and faulty operation of the touch panels. Apparently the computer was down fairly frequently; this frustrated the students and made it difficult for the institutions to keep to their computer schedules. With the touch panels it was often difficult for the student to obtain a response with his pushing, or an inappropriate response was obtained. Some repairing of touch panels took place, and later

TABLE 12

PROBLEMS CITED IN DAILY LOGS

	St. Cloud	Sauk Centre	Red Wing
Mathematics			
Period of Record	10/5 - 1/31	10/11 - 1/31	11/1 - 1/31
Hardware Problems	31	37	21
Software Problems	2	22	9
Total	33	59	30
Reading			
Period of Record	3/2 - 4/17	3/1 - 4/14	3/3 - 4/13
Hardware Problems	3	23	6
Software Problems	17	22	3
Total	20	45	9

the option was made available, in many cases, to type in the answer rather than touching the screen. Other technical problems mentioned include inappropriate characters on the screen, the machine's failure to respond to buttons pushed, and a slow reaction time on the part of the machine. Sauk Centre experienced several blown fuses.

While these problems were occasionally disruptive, there appeared to be, overall, a fairly smooth functioning of the technology. The Title I teachers indicated that this was largely due to the speedy handling of technical problems by the staff of Control Data Corporation. Reportedly, these people were very helpful in responding to messages, and did their repair work promptly.

Curricular Concerns

In their interviews students did not distinguish among the different curriculum packages nor did they have consistent views about specific lessons. In general, they felt that the lessons were good, and found the mathematics games especially fun. The views of the teachers are more curriculum-specific, and are presented below.

PCP Mathematics Curriculum. This curriculum was generally favored over the other mathematics curriculum available. The overall quality of the lessons was considered good. However, the lessons did not follow a true sequence, and there were gaps that needed to be filled. The package was thought to be especially weak in division, and especially strong in fractions, decimals, and percent. The nonsequential nature of the curriculum allowed individual topics to be assigned for specific remedial purposes. The variety of answering formats used created some problems for the students.

The mathematics games were seen to be highly motivating to the students, especially on account of their competitive aspects. It was thought that the games provided some of the most helpful instruction, and constituted good drill.

Basic Skills Mathematics Curriculum. This curriculum was not looked upon favorably by the teachers. The content and presentation were considered too elementary, and the students tended to become bored. The material seemed to be intended for an initial exposure to the topics, and thus it did not meet the remedial needs of the Title I population; concepts were stressed rather than the drill that was needed. The curriculum was seen as inflexible. Once the student was placed by the Inventory Test, he had to work through all the succeeding lessons. Sometimes one careless error by the student would place him in a strand in which he was actually already proficient. Since there was no way to alter this placement, the student was forced to work through material he already knew. It was not possible to access individual lessons for specific remedial purposes. Also, some of the lessons were quite long, and when a student could not complete a lesson during his scheduled period, he was required to begin the lesson over again the next time. Students were sometimes sent into a strand in which they should not have been working.

All these problems tended to create frustration in both the students and their teachers. Letters were sent from MECC to Control Data Corporation explaining the nature of the problems encountered. However, the institutions gradually discarded this curriculum in favor of the PCP Mathematics Curriculum. Toward the end of the mathematics-on-computer period, only St. Cloud was

continuing to use the curriculum on any sort of a regular basis. It was widely felt that many of the problems experienced with the Basic Skills Mathematics Curriculum were due to the preliminary status of the version used at the three institutions.

Basic Skills Reading Curriculum. This curriculum was received much more favorably than the associated mathematics curriculum, perhaps because it was at a more advanced stage of development. The lessons were seen as basically sound but somewhat slow-moving and repetitious, resulting in some boredom among the students. Directions were not always clear. The testing was considered a bit easy, with students sometimes being able to pass out of clusters without really knowing the material. An insufficient variety of test and lesson items was mentioned, and errors both in test and lesson content were pointed out. Problems in using this curriculum were fewer and less severe than for the associated mathematics curriculum. Especially appreciated were the teacher's capability of advancing or regressing a student in the curriculum, and the student's ability, in some cases, to continue a lesson or test from where he left off, rather than to start all over from the beginning. Teachers were mixed, however, on whether the curriculum was actually teaching the students to read better.

Teachers felt that the reading games available were too few in number and not very motivating to the students. The games were seen as either at too high a level or not really related to reading. At St. Cloud students were allowed to play math games during their game period, rather than the less-motivating reading games.

It should be noted that the evaluators, in inspecting the computer

curricula, came up with essentially the same conclusions as were expressed by the Title I teachers at the three institutions.

Student Interaction with the Computer

The teachers expressed the view that while many students read the directions before answering questions on the computer, many others did not. Some were unable to read the directions, and others were disinclined to do so, being impatient to get on with answering. Guessing was considered a problem since many students wouldn't take the time to think about their answers. Inability to get the correct response would lead the student to read the directions more carefully or to ask the teacher for help. Some students had trouble typing in answers quickly and correctly; some had problems signing on. The computer's failure to respond according to the student's expectations, whether through the student's fault or not, led to frustration and anger directed at the machine. The student's main objective was seen by some as simply getting through the lesson so that another check could be placed on the progress chart.

Speaking to the students tended to confirm the teachers' views. Many students admitted to not being able to read the directions, not taking the time to read them, guessing the answers, asking the teacher when stuck, and poor typing skills. Others, however, said they were able to work through the lessons carefully without problems.

The hours spent by the evaluators in observing students at the computer revealed the variety of types of student-computer interaction described above. However, overall the students seemed involved and interested in what they were doing on the computer.

Administrative Concerns

The introductory workshop conducted by the MECC staff in September was received favorably by the Sauk Centre Title I teachers. However the St. Cloud teachers thought that the workshop could have been better organized and carried out in a shorter period of time. The evaluators tended to concur with this latter point of view. At Red Wing no extensive workshop was necessary.

All three institutions felt that the MECC staff were very helpful in dealing with problems connected with the CAI program, although at first this communication was a bit strained at St. Cloud. The curriculum guide provided was considered helpful at St. Cloud and unnecessary at Red Wing, since the Red Wing staff were familiar with the PCP lessons from the previous year. At Sauk Centre the guide was seen as incomplete and not particularly useful, the staff feeling it necessary to work through the lessons themselves in order to use them effectively.

Sauk Centre and Red Wing found the MECC guidelines for carrying out the CAI program to be generally acceptable but somewhat restrictive. Both institutions mentioned that the extra time added to Title I created scheduling conflicts with other institutional programs. Sauk Centre felt that a larger percentage of game periods should be allowed to the students. St. Cloud, however, considered the MECC guidelines to be unnecessarily restrictive. The staff felt that they should be allowed to use the computer terminal as they thought best, being free to choose lessons and schedule time periods in accordance with the perceived needs of specific students.

The teachers at Sauk Centre and Red Wing reported that their students generally received their scheduled time on the computer. Absences, for a

variety of reasons, did occur sometimes. At St. Cloud, however, the scheduling guidelines were more difficult to follow. Some students refused to use the computer, others used the computer for more than their scheduled time, and sometimes conflicts with other programs caused several students to be scheduled for the computer during the same time period. All institutions reportedly stayed close to the guidelines for dividing the computer periods between instructional lessons and games.

Since the computer terminal at St. Cloud was located in a Title I classroom, the Title I teacher could from time to time monitor the student's work on the computer. However, the teacher usually didn't have the time to watch the student closely, something considered necessary when the student's lessons are not under the direct control of the teacher, as in the Basic Skills curricula. The situation was even worse at Sauk Centre where the Title I teachers gave tutorial instruction in rooms different from where the terminals were located, and ordinarily no teacher was stationed in the computer room to give help. At Red Wing this was not a problem since the Title I computer person was devoting full time to the students on the computer.

In keeping track of student time and progress on the computer, the St. Cloud and Red Wing teachers tended to rely mainly on the records kept by the computer. Sauk Centre, however, had a well-organized off-line record-keeping system that seemed to allow better control of the work the student was doing on the computer.

Teachers at the three institutions seemed to agree that work on the PCP Mathematics Curriculum could be used to supplement the regular Title I instruction, since the teacher has the freedom to assign computer lessons

that fit in with the student's regular work. The two Basic Skills curricula, however, were not successfully integrated into the regular Title I instruction, primarily because access to particular desired lessons of these curricula was limited. The teachers felt that the content of the regular program was not much affected by having a computer component, but that the schedule had been altered by the splitting up of time blocks to accommodate the computer time requirements. At Sauk Centre the fractured schedule plus the running back and forth of teachers to the computer room was seen as reducing somewhat the amount of tutorial instruction given. At St. Cloud this reduction was more obvious since the computer time was taken out of the regular Title I instructional time. At both these institutions the computer component was seen as creating considerable additional work for the Title I teachers. At Red Wing neither of these problems was mentioned.

The Title I teachers felt that the Department of Corrections was generally helpful and supportive concerning the CAI program at the three institutions. However, the Department was in some cases seen as pushing the use of the computer without taking adequate account of the specific situational variables operating at each institution.

D. Staff Attitudes

The two Title I teachers at Red Wing who are involved with the computer are both strongly committed to its continued use at their institution. The Sauk Centre Title I staff, after initial frustration in implementing the CAI program, have become more favorably disposed toward the computer. Both staffs see the computer as basically another tool to supplement the methods and materials already available for Title I instruction. They would like

to see more flexibility allowed in using the computer and a greater diversity of curricula available that would aim more specifically at meeting the remedial needs of the Title I population. These teachers feel that the computer is a good experience for their students and that it has motivating qualities, but are unsure whether it contributes any more to their learning than regular tutorial instruction. The teachers at Sauk Centre showed initial concern that they might be replaced by the computer, but seeing that successful use of the computer is dependent upon teacher help seems to have relieved this anxiety.

At St. Cloud, however, there is a general negative feeling among the Title I staff toward the computer. The staff reportedly feel that the computer was forced upon them, that they had to accept it or forego their Title I program, and that the funds could have been more profitably spent in obtaining an additional teacher aide that they felt they needed. The teachers said they had given the computer their best try, had found that the students responded better to tutorial instruction, and had little confidence that the computer was actually doing much good. These considerations, along with the restrictions imposed on the use of the computer and the extra work required of the staff, have resulted in a declining commitment on the part of the teachers toward using the computer in the Title I program.

E. Computer Use and Costs

The records of computer use for the Title I program, kept by the computer, are summarized in Table 13 for the three institutions. Use of the mathematics and reading curricula are tabled separately. The results indicate that the PCP Mathematics Curriculum was used much more extensively than

TABLE 13

TITLE I COMPUTER USE

Mathematics

Site	Period of Record	No. of Students	Computer Use in Mean Hours per Day: Students PCP	Students Basic Skills	Students Total	Teachers PCP	Teachers Basic Skills	Teachers Total	Grand Total	No. of Terminals	Per Terminal
St. Cloud	10/5-2/28	41	1.4	0.9	2.3	1.5	0.7	2.2	4.5	1	4.5
Sauk Centre	9/30-2/28	80	3.4	0.8	4.2	1.6	0.1	1.7	5.9	2	3.0
Red Wing	10/28-2/28	74	2.9	0.6	3.5	1.7	0.1	1.8	5.3	2	2.7

Reading

(Period of Record: 3/1 - 5/9)

Site	No. of Students	Computer Use in Mean Hours per Day: Students Basic Skills	Students Games	Students Total	Teachers	Grand Total	No. of Terminals	Per Terminal
St. Cloud	36	2.2	0.8	3.0	1.2	4.2	1	4.2
Sauk Centre	49	4.6	0.8	5.4	0.5	5.9	2	3.0
Red Wing	26	2.3	0.3	2.6	0.3	2.9	2	1.5

the Basic Skills Mathematics Curriculum, although this disparity was not so great at St. Cloud. The St. Cloud teachers also seemed to spend more time looking through the two Basic Skills curricula than the teachers at the other two institutions. However, during the period of the reading curriculum, the St. Cloud teachers appeared to allow the students more use of games than was originally specified. Finally, the results show that the two terminals each at Sauk Centre and Red Wing were much underutilized, at least by Title I students and staff. This was especially the case at Red Wing during the period of the reading curriculum.

The computer cost information obtained from MECC is given in Table 14. Thus it costs approximately $2,133 per month to maintain two PLATO terminals at a site and $1,188 per month to operate one terminal. This includes the cost of using the Basic Skills curricula, not charged during the current evaluation year but expected to be charged in future. Use of the PCP Mathematics Curriculum has been, and will continue to be, free of charge.

TABLE 14

COSTS IN OPERATING PLATO TERMINALS

Expense	Cost per Month	
	Two-Terminal Site	One-Terminal Site
Terminal leasing	$1,680	$840
Communications	288	258
Basic Skills curricula	150	75
Miscellaneous (approx.)	15	15
Total	$2,133	$1,188

V. RECOMMENDATIONS

Based on the findings presented in the previous chapter concerning the Title I CAI program, the following recommendations are offered:

1. The empirical data on attitudes and achievement presented in this report should not be considered as a definitive test of the value of CAI programs in correctional institutions. The failure to find computer effects might be a result of the way in which the computer was used in this particular CAI program, and the computer curricula that were available. It is possible that different ways of using the computer, perhaps in association with different computer curricula, would produce more favorable results.
2. The computer should be looked upon as a learning tool in Title I instruction, a supplement to the forms of instruction already available. Since the computer is a tool, it would seem best to allow maximum flexibility in its use, the main objective being to further each student's specific remedial goals in the Title I program. Thus the Title I teachers should be free to decide when a particular student is most likely to benefit from using the computer, what type of lesson he should work on, and how much time he should spend. Outside regulation of these variables is probably no longer desirable. In addition, the time spent on the computer should be looked upon as part of the regular Title I instructional time, rather than as an add-on time with all the problems this entails.
3. To further the integration of the computer into the regular Title I program, curricula should be made available that address the specific

remedial needs of the Title I population. Skills should be stressed rather than concepts. Teachers should be able to access individual lessons that are relevant to the current needs of particular students. A wide diversity of topics should be included. It would be best to provide the teachers with rather complete curriculum guides, and to allow them some time to gain familiarity with the lessons available.

4. It seems best to have a teacher in the computer room at all times to monitor the students' work on the computer and to provide help when necessary. Such a teacher should know what each student is trying to accomplish on the computer, and how this fits into his other Title I instruction. The teacher can observe the student's mode of interacting with the computer, and through instruction can help make this interaction more effective. An efficient off-line record-keeping system can help to expedite these procedures.
5. Technical problems with the terminals can continue to be handled through Control Data Corporation. Perhaps the site personnel can be instructed as to measures they could take to correct certain kinds of problems themselves.
6. Since the Title I staff at St. Cloud are so negatively disposed toward the computer, they should no longer be required to use it in their Title I program. The negative feeling of the teachers would be sure to work against the successful use of the computer at that institution. However, should the St. Cloud staff be willing to give the computer another try, perhaps based on the guidelines suggested above, then there is no reason to suspect that the computer couldn't be used as successfully at that institution as anywhere else.

7. The Title I staffs at Sauk Centre and Red Wing should be allowed to continue to use the computer in their Title I programs. Current use would suggest that one terminal at each institution is sufficient. However, implementation of the guidelines suggested above or extension of terminal availability to non-Title I students might require the retention of two terminals at each institution.
8. Future evaluation efforts should be directed at determining what kinds of students are most benefited by using the computer, and under what sorts of circumstances. Records should be kept, preferably by site personnel, concerning achievement, attitude, and personality variables of students using the computer, the lessons assigned, the mode of interaction with the computer, and the results achieved. In this way the Title I teachers will gain some idea of how to predict when a particular student will be successful with the computer, and will be able to pass on this information to others.

APPENDIX A

Student Attitude Survey

STUDENT ATTITUDE SURVEY

Name _____

Place _____

Date _____

Directions

The following statements are about many different things. Please read each statement carefully and decide how you feel about the statement. Then circle one of the answers to the right of the statement according to the following directions:

If you strongly agree with the statement, circle the SA.

If you agree with the statement, circle the A.

If you disagree with the statement, circle the D.

If you strongly disagree with the statement, circle the SD.

Please circle only one answer for each statement. Be sure to answer every question.

Of course, there are no right or wrong answers. Just answer each statement according to the way you feel at the present time.

ATTITUDES TOWARD MATHEMATICS

		STRONGLY AGREE (SA)	AGREE (A)	DISAGREE (D)	STRONGLY DISAGREE (SD)
1.	Mathematics is useful for the problems of everyday life	SA	A	D	SD
2.	Mathematics is something which I enjoy very much . .	SA	A	D	SD
3.	I don't do very well in mathematics	SA	A	D	SD
4.	Working mathematics problems is fun	SA	A	D	SD
5.	I would like to do some outside reading in mathematics	SA	A	D	SD
6.	Mathematics is easy for me	SA	A	D	SD
7.	When I hear the word mathematics, I have a feeling of dislike	SA	A	D	SD
8.	Sometimes I work ahead on my mathematics lessons . .	SA	A	D	SD
9.	Mathematics is helpful in understanding today's world	SA	A	D	SD
10.	No matter how hard I try, I cannot understand mathematics	SA	A	D	SD
11.	I feel tense when someone talks to me about mathematics	SA	A	D	SD
12.	Mathematics is of great importance to a country's development	SA	A	D	SD
13.	It makes me nervous to even think about doing mathematics	SA	A	D	SD
14.	I am good at working mathematics problems	SA	A	D	SD
15.	Sometimes I work more mathematics problems than are assigned to me	SA	A	D	SD
16.	Working with numbers upsets me	SA	A	D	SD

	STRONGLY AGREE (SA)	AGREE (A)	DISAGREE (D)	STRONGLY DISAGREE (SD)
17. It is important to know mathematics in order to get a good job	SA	A	D	SD
18. It scares me to have to take mathematics	SA	A	D	SD
19. I have a good feeling toward mathematics	SA	A	D	SD
20. I would like to hear someone give a talk about mathematics	SA	A	D	SD

ATTITUDES TOWARD READING

		STRONGLY AGREE (SA)	AGREE (A)	DISAGREE (D)	STRONGLY DISAGREE (SD)
1.	Reading turns me on	SA	A	D	SD
2.	I don't need reading in my life	SA	A	D	SD
3.	I understand most of what I read	SA	A	D	SD
4.	I read as little as possible	SA	A	D	SD
5.	Reading is useful	SA	A	D	SD
6.	I am a poor reader	SA	A	D	SD
7.	There are many books which I hope to read	SA	A	D	SD
8.	Reading is dull	SA	A	D	SD
9.	There is nothing to be gained from reading books . .	SA	A	D	SD
10.	Reading is easy for me	SA	A	D	SD
11.	I never seem to finish a book	SA	A	D	SD
12.	I like to read during my spare time	SA	A	D	SD

ATTITUDES TOWARD LEARNING AND EDUCATION

		STRONGLY AGREE (SA)	AGREE (A)	DISAGREE (D)	STRONGLY DISAGREE (SD)
1.	I really enjoy learning new things	SA	A	D	SD
2.	I forget most of what I learn	SA	A	D	SD
3.	Each new lesson makes me want to learn more	SA	A	D	SD
4.	Education can help me get the most out of life . . .	SA	A	D	SD
5.	I don't care to put a lot of effort into schoolwork	SA	A	D	SD
6.	Learning new things is not much fun	SA	A	D	SD
7.	I learn new things quickly	SA	A	D	SD
8.	I see no value in education	SA	A	D	SD
9.	I would rather do anything else than study	SA	A	D	SD
10.	When I try, I can learn things well	SA	A	D	SD
11.	Education isn't useful for the problems of life . .	SA	A	D	SD
12.	I don't care about learning new things	SA	A	D	SD
13.	Doing schoolwork is fun	SA	A	D	SD
14.	I am not a good student	SA	A	D	SD
15.	Education can help me get ahead in the world	SA	A	D	SD
16.	I want to know as much about a subject as possible .	SA	A	D	SD

ATTITUDES TOWARD LEARNING ON THE COMPUTER

		STRONGLY AGREE (SA)	AGREE (A)	DISAGREE (D)	STRONGLY DISAGREE (SD)
1.	The computer helped me to learn	SA	A	D	SD
2.	Using the computer was a waste of time	SA	A	D	SD
3.	I enjoyed using the computer	SA	A	D	SD
4.	Most of the computer work was too difficult for me to handle	SA	A	D	SD
5.	I liked working at my own pace on the computer . . .	SA	A	D	SD
6.	I felt as though I was being controlled by a machine	SA	A	D	SD
7.	I made lots of mistakes on the computer	SA	A	D	SD
8.	The computer made the lessons interesting	SA	A	D	SD
9.	The computer went through the lessons too quickly .	SA	A	D	SD
10.	I didn't care when I made a mistake because no one was watching me	SA	A	D	SD
11.	There wasn't enough time to finish a lesson	SA	A	D	SD
12.	The computer didn't teach me anything new	SA	A	D	SD
13.	I learned faster on the computer	SA	A	D	SD
14.	The computer lessons were too much alike	SA	A	D	SD
15.	Using the computer made me feel tense	SA	A	D	SD
16.	It was easier to learn on the computer	SA	A	D	SD
17.	I spent more time running the machine than learning the lessons	SA	A	D	SD
18.	Often the computer broke down	SA	A	D	SD

Please write anything else you would like to say about learning on the computer.

APPENDIX B

Staff and Student Interview Schedules

STAFF INTERVIEW - December, 1977

Introduction

Could you please describe your own role in the CAI program?

What do you see as the main purposes of the CAI program here at (Minnesota Home School, State Reformatory for Men, State Training School)?

What are your own feelings about these purposes?

Thus far, how well do you think these purposes are being achieved?

Let us look first at the computer curriculum available in math. What do you think of this curriculum?

What do you think of the Basic Skills Curriculum?

What do you think of the PCP lessons?

What problems have you had in implementing the math curriculum?

What is the procedure you use in deciding what lessons to assign to students?

What techniques do you use in monitoring student progress?

How do you decide when to change the student's lessons?

What has been the reaction of students to the CAI program in math?

Do they like using the computer to do math?

To what degree have they benefited from the program?

According to the original plan, students were going to work on the computer for (22-1/2, 15, 20) minutes, (4, 3, 3) times a week. In actual fact, has it worked out this way?

Please explain.

How has the computer time been divided between instructional lessons and games?

How about the student contracts. How have they worked out?

What about the on-line daily logs?

How about the testing?

What are your views regarding the MECC input into the CAI program?

What did you think of the workshops given by the MECC staff?

What about the MECC guidelines for implementing the CAI program?

How about the curriculum guide prepared by MECC?

How helpful has the MECC staff been when you have problems?

What about relationships with CDC. How have they been?

How about relationships with the Department of Corrections concerning the CAI program?

How does the CAI program fit into the regular Title I instructional program?

How has it caused the regular program to change?

What has been the reaction of the staff here concerning the CAI program?

What about the level of staff commitment to the CAI program?

Overall, how successful do you think the CAI program has been thus far?

What recommendations would you give for changing the CAI program?

What other factors regarding the CAI program would you like to mention?

STUDENT INTERVIEW - December, 1977

Introduction

Have you used the computer to learn math?

How much time do you spend on the computer?

Is this too much, too little, or about right?

How do you feel about doing math on the computer?

Do you like it?

Does it help you to learn math?

Is it easy or hard?

What problems do you have in using the computer?

Is there someone there to help you when you have problems?

What kind of help do you get?

Is it enough?

What do you think of the computer lessons in math?

Which lessons are the most useful?

Which lessons are the most fun?

Which are the worst lessons?

What is wrong with them?

How does your work on the computer fit in with your other schoolwork?

How can using the computer be improved?

What other comments do you have about using the computer?

STAFF INTERVIEW - April, 1978

Introduction

Could you please describe your own role in the CAI reading program?

What do you see as the main purposes of the CAI reading program here at (Minnesota Home School, State Reformatory for Men, State Training School)?

What are your own feelings about these purposes?

Thus far, how well do you think these purposes are being achieved?

Let us look first at the computer curriculum available in reading. What do you think of the Basic Skills Reading Curriculum?

What do you think of the lessons within the curriculum?

What do you think of the testing within the curriculum?

What do you think the curriculum is actually teaching the students?

Do you think it helps the students to read better?

What problems have you had in using the Basic Skills Reading Curriculum?

What is the procedure you use in deciding what reading lessons to assign to students?

What has been the reaction of students to the CAI program in reading?

Do they like using the computer to do reading?

How would you characterize the interaction between the student and the computer during a reading lesson?

According to the original plan, students were going to work on the computer for (22-1/2, 15, 20) minutes, (4, 3, 3) times a week. In actual fact, has it worked out this way for the CAI reading program?

Please explain.

How has the computer time been divided between instructional lessons and games for the CAI reading program?

What do you think of the games available in reading?

What are your views regarding the MECC input into the CAI reading program?

What about relationships with CDC concerning the CAI reading program? How have they been?

How about relationships with the Department of Corrections concerning the CAI reading program?

How does the CAI reading program fit into the regular Title I instructional program in reading?

How has it caused the regular program to change?

What has been the reaction of the staff here concerning the CAI reading program?

What about the level of staff commitment to the CAI reading program?

Overall, how successful do you think the CAI reading program has been thus far?

What recommendations would you give for changing the CAI reading program?

What other factors regarding the CAI reading program would you like to mention?

STUDENT INTERVIEW - April, 1978

Introduction

Have you used the computer to do reading?

How much time do you spend on the computer?

Is this too much, too little, or about right?

How do you feel about doing reading on the computer?

Do you like it?

Is it easy or hard?

What problems do you have in using the computer?

Is there someone there to help you when you have problems?

What kind of help do you get?

Is it enough?

What do you think of the computer lessons in reading?

What kind of lessons do you like best?

What kind of lessons do you like worst?

When the computer gives you a question, do you read the question carefully before giving an answer?

Do you think hard about the answer or do you guess at it?

What do you really learn from the computer lessons in reading?

Do the lessons help you to read better?

How do the computer lessons fit in with your other schoolwork?

What do you like best about using the computer?

What do you like worst about using the computer?

Would you rather use the computer or work with a teacher? Why?

How can using the computer be improved?

What other comments do you have about using the computer?

APPENDIX C

TABE Results: All Institutions Combined

I. Reading Vocabulary Subtest

	N	Mean Grade Level			Mean Hours of Reading Instruction	
		Pretest	Posttest	Change	Total	On Computer
All Students	141	6.0	6.4	+0.4[1]	27.5	3.0
By Total Hours of Instruction						
High (30-106)	49	6.1	6.5	+0.4	47.3	5.0
Medium (17-29)	45	5.6	6.1	+0.5	23.7	3.3
Low (2-16)	47	6.5	6.6	+0.1	10.5	0.7
By Computer Use						
Some	74	5.8	6.0	+0.2	33.7	5.8
None	67	6.3	6.8	+0.5	20.7	0.0

[1]Change significant at $p < .02$

Multiple Regression on Change Scores

Step	Variable Entered	Simple r	Multiple r	Significance of Multiple r Change
1	Total Hours	.04	.04	NS
2	Computer Hours	-.02	.07	NS

II. Reading Comprehension Subtest

	N	Mean Grade Level			Mean Hours of Reading Instruction	
		Pretest	Posttest	Change	Total	On Computer
All Students	138	5.4	6.0	+0.6[1]	27.5	3.0
By Total Hours of Instruction						
High (30-106)	48	5.4	6.7	+1.3[2]	47.2	5.1
Medium (17-29)	44	5.2	5.6	+0.4	23.8	3.2
Low (2-16)	46	5.7	5.7	0.0[2]	10.6	0.7
By Computer Use						
Some	72	5.2	5.8	+0.6	33.6	5.8
None	66	5.6	6.3	+0.7	20.9	0.0

[1]Change significant at $p < .001$

[2]Difference in change significant at $p < .02$

Multiple Regression on Change Scores

Step	Variable Entered	Simple r	Multiple r	Significance of Multiple r Change
1	Total Hours	.13	.13	NS
2	Computer Hours	.10	.14	NS

III. Mathematics Computation Subtest

	N	Mean Grade Level			Mean Hours of Mathematics Instruction	
		Pretest	Posttest	Change	Total	On Computer
All Students	175	6.2	7.1	+0.9[1]	23.8	3.7
By Total Hours of Instruction						
High (27-73)	60	5.7	6.8	+1.1[2]	38.1	5.9
Medium (17-26)	56	6.2	7.1	+0.9	21.8	3.0
Low (3-16)	59	6.7	7.4	+0.7[2]	11.2	2.0
By Computer Use						
Some	132	6.1	7.0	+0.9	26.1	4.9
None	43	6.4	7.3	+0.9	16.8	0.0

[1]Change significant at $p < .001$

[2]Difference in change significant at $p < .01$

Multiple Regression on Change Scores

Step	Variable Entered	Simple r	Multiple r	Significance of Multiple r Change
1	Total Hours	.23	.23	$p < .005$
2	Computer Hours	.03	.24	NS

APPENDIX D

SAS Results: All Institutions Combined

I. Attitudes toward Mathematics (Total Scale Score)

(minimum score = 20, maximum score = 80, neutral point = 50)

		Mean Score			Mean Hours of Mathematics Instruction	
	N	Pretest	Posttest	Change	Total	On Computer
All Students	180	54.2	56.6	+2.4[1]	23.8	3.6
By Total Hours of Instruction						
High (27-73)	63	53.5	55.6	+2.1	38.1	5.7
Medium (17-26)	56	53.1	56.7	+3.6	21.8	3.0
Low (3-16)	61	55.9	57.5	+1.6	11.0	2.0
By Computer Use						
Some	136	54.2	56.7	+2.5	25.8	4.8
None	44	54.1	56.2	+2.1	17.7	0.0

[1]Change significant at $p < .001$

Multiple Regression on Change Scores

Step	Variable Entered	Simple r	Multiple r	Significance of Multiple r Change
1	Total Hours	.08	.08	NS
2	Computer Hours	.02	.08	NS

II. Attitudes toward Reading (Total Scale Score)

(minimum score = 12, maximum score = 48, neutral point = 30)

		Mean Score			Mean Hours of Reading Instruction	
	N	Pretest	Posttest	Change	Total	On Computer
All Students	142	33.9	35.0	+1.1[1]	24.9	3.0
By Total Hours of Instruction						
High (28-105)	50	33.6	34.7	+1.1	42.1	5.6
Medium (17-27)	41	33.9	35.2	+1.3	22.5	2.8
Low (2-16)	51	34.1	35.1	+1.0	10.0	0.7
By Computer Use						
Some	76	33.7	35.1	+1.4	32.6	5.7
None	66	34.1	34.9	+0.8	16.1	0.0

[1]Change significant at $p < .01$

Multiple Regression on Change Scores

Step	Variable Entered	Simple r	Multiple r	Significance of Multiple r Change
1	Total Hours	.05	.05	NS
2	Computer Hours	.02	.05	NS

III. Attitudes toward Learning and Education (Total Scale Score)

(minimum score = 16, maximum score = 64, neutral point = 40)

		Mean Score			Mean Hours of Mathematics and Reading Instruction	
	N	Pretest	Posttest	Change	Total	On Computer
All Students	186	47.0	48.4	+1.4[1]	42.2	5.8
By Total Hours of Instruction						
High (52-139)	63	46.8	48.7	+1.9	70.8	9.0
Medium (25-51)	60	45.7	47.1	+1.4	37.6	5.6
Low (7-24)	63	48.6	49.2	+0.7	17.8	2.8
By Computer Use						
Some	171	47.0	48.4	+1.4	43.2	6.3
None	15	48.1	48.1	0.0	30.5	0.0

[1]Change significant at $p < .001$

Multiple Regression on Change Scores

Step	Variable Entered	Simple r	Multiple r	Significance of Multiple r Change
1	Total Hours	.08	.08	NS
2	Computer Hours	.09	.10	NS

IV. Subscale Results[1]

Attitude Area	Subscale	Mean Score Change
Mathematics		
	Unanxiety	+0.4
	Value	+0.2
	Self-Concept	+1.1
	Enjoyment	+0.5
	Motivation	+0.2
Reading		
	Value	+0.2
	Self-Concept	+0.5
	Enjoyment	+0.2
	Motivation	+0.3
Learning and Education		
	Value	+0.2
	Self-Concept	+0.7
	Enjoyment	+0.1
	Motivation	+0.4

[1]All multiple regression results are nonsignificant.

V. Computer Section Results

Item	Mean Score (N = 172)
1	3.1
2	3.3
3	3.3
4	3.2
5	3.2
6	3.2
7	2.8
8	3.1
9	3.2
10	3.1
11	2.7
12	3.2
13	2.8
14	2.9
15	3.1
16	3.0
17	3.1
18	2.8
Total	54.8